AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

[Aerological Division, L. T. Samuels temporarily in charge]

The outstanding features of the average free-air temperatures for December as shown in table 1 are the large positive departures at Dallas and Omaha, and the negative departures at Pembina. This steepening of the normal south-north latitudinal temperature gradient resulted in higher free-air resultant wind velocities than normal for the month as was evident at a number of stations (table 2). Resultant directions were close to normal, except along the Pacific coast, where a preponderance of westerly winds prevailed as compared to the normal northerly components.

Free-air relative humidity departures were mostly small and insignificant except at Boston where large positive departures occurred.

TABLE 1.—*Free-air temperatures and relative humidities obtained by airplanes during December 1933*

TEMPERATURE (° C.)

Altitude (meters) m.s.l.	Boston, Mass.[1] (6 m)		Cleveland, Ohio[2] (246 m)		Dallas, Tex.[3] (146 m)		Omaha, Nebr.[4] (300 m)		Pembina, N.Dak.[5] (243 m)		San Diego, Calif.[6] (9 m)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	−2.1	(7)	−0.7	(7)	7.8	(7)	−3.7	(7)	−20.4	(7)	11.0	−2.4
500	−2.6	(7)	−0.5	(7)	11.7	(7)	−2.2	(7)	−19.3	(7)	12.9	−0.2
1,000	−3.4	−2.0	−1.3	+3.0	13.5	+6.8	0.4	+3.3	−16.1	(7)	13.5	+1.0
1,500	−4.1	−2.9	−1.9	+2.5	12.5	+6.5	1.8	+4.4	−12.1	−3.8		
2,000	−5.1	−2.2	−2.3	+3.3	10.6	+6.1	1.2	+5.2	−12.2	−2.7	9.7	+1.0
2,500	−6.7	−2.3	−3.2	+4.2	8.1	+5.6	−0.8	+5.5	−13.2	−1.7		
3,000	−8.5	−1.4	−4.8	+4.8	5.5	+5.2	−3.3	+5.4	−15.4	−1.3	4.8	+0.8
4,000	−12.3	+0.2	−9.9	+5.6	−0.4	+4.6	−9.4	+4.5	−20.9	−0.8	−1.5	+0.5
5,000	−17.6	+0.5	−15.8	+5.6	−7.7	+2.8	−16.2	+3.2	−27.8	−1.2		

RELATIVE HUMIDITY (PERCENT)

Surface	75	(7)	81	(7)	82	(7)	80	(7)	84	(7)	73	+11
500	72	(7)	74	(7)	66	(7)	73	(7)	73	(7)	59	+4
1,000	69	+12	72	+5	57	+1	60	−3	68	(7)	45	0
1,500	65	+14	61	+4	50	+3	50	−7	65	+6		
2,000	59	+13	53	+1	43	+3	46	−9	63	+6	29	−2
2,500	57	+13	48	−3	35	−2	47	−9	58	+1		
3,000	58	+16	49	−1	31	−3	46	−11	57	0	22	−2
4,000	61	+20	50	−2	24	−10	47	−10	57	0	19	−1
5,000	52	+12	48	−1	23	−10	47	−10	54	+3		

Times of observations: Weather Bureau, 5 a.m.; Navy, 7 a.m.; and M.I.T., 8 a.m., E.S.T.

[1] Observations made by Massachusetts Institute of Technology; departures based on normals obtained from kite observations made at Blue Hill Meteorological Observatory.
[2] Temperature departures based on normals determined by extrapolating latitudinally those of Royal Center, Ind., and Due West, S.C. Humidity departures based on normals of Royal Center, Ind.
[3] Temperature departures based on normals determined by interpolating latitudinally those of Groesbeck, Tex., and Broken Arrow, Okla. Humidity departures based on normals of Groesbeck, Tex.
[4] Temperature and humidity departures based on normals of Drexel, Nebr.
[5] Temperature departures based on normals determined by extrapolating latitudinally those of Ellendale, N.Dak., and Drexel, Nebr. Humidity departures based on normals of Ellendale, N.Dak.
[6] Naval air station.
[7] Departures for the surface and for these levels omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a.m. (E.S.T.) during December 1933*

[Winds from N=360°, E=90°, etc.]

Altitude (meters) m.s.l.	Albuquerque, N. Mex. (1,554 meters)		Atlanta, Ga. (309 meters)		Bismarck, N.Dak. (518 meters)		Brownsville, Tex. (7 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Chicago, Ill. (192 meters)		Cleveland, Ohio (245 meters)		Dallas, Tex. (154 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	351	1.4	301	1.1	60	1.0	192	1.1	212	1.6	265	6.0	284	1.1	220	2.4	250	0.4	226	2.0	273	0.8	48	3.0
500			268	3.6			182	9.2	237	4.0			273	3.0	245	5.8	233	5.3			251	3.2	87	5.8
1,000			270	7.2	289	5.9	194	7.3	284	7.5			288	6.7	270	9.0	260	7.9	238	5.2	258	3.6	111	4.5
1,500			267	8.1	280	10.3	190	3.8	285	11.0			287	9.5	267	11.8	259	7.9	260	12.0	273	5.0	95	2.4
2,000	312	3.6	266	8.4	278	10.9	244	1.9	286	13.2	268	9.6	292	13.7	270	14.6	268	7.1	271	15.3	270	5.9	40	.6
2,500	307	6.5	281	6.9	283	12.5	271	2.8	288	14.9	277	13.9	276	14.9	270	18.2	263	8.1	280	15.5	270	6.2	327	1.9
3,000	305	9.3	281	10.2			268	4.2	286	17.8	285	16.1			281	19.2	269	9.2	284	13.7	282	7.1	336	1.5
4,000	286	12.6	282	9.8			265	4.6			285	15.9					284	11.4					249	.6
5,000	285	12.5					265	5.9															276	2.6

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a.m. (E.S.T.) during December 1933*—Continued

Altitude (meters) m.s.l.	Los Angeles, Calif. (217 meters)		Medford, Oreg. (410 meters)		Memphis, Tenn. (83 meters)		New Orleans, La. (1 meter)		Oakland, Calif. (8 meters)		Oklahoma City, Okla. (402 meters)		Omaha, Nebr. (306 meters)		Phoenix, Ariz. (338 meters)		Salt Lake City, Utah (1,294 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Washington, D.C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	338	2.1	142	1.2	227	0.2	52	0.3	120	1.5	273	0.6	104	0.6	96	2.3	147	3.1	348	1.0	180	2.5	311	1.4
500	334	1.6	154	1.9	234	5.2	227	3.6	168	1.9	233	1.1	218	1.9	96	2.6	------	------	323	2.4	207	11.2	274	6.5
1,000	100	.5	179	4.4	259	5.1	251	5.8	201	1.8	252	4.1	251	4.4	69	1.6	------	------	314	6.6	217	12.8	276	9.2
1,500	212	1.2	219	7.4	267	7.4	252	6.3	238	2.8	255	6.2	265	6.4	303	.5	165	5.2	304	9.8	234	11.8	290	15.0
2,000	265	2.7	231	12.0	258	8.7	276	5.6	256	3.3	255	8.2	273	9.9	286	1.7	195	5.3	293	13.5	240	13.8	284	15.2
2,500	258	3.7	237	14.3	276	9.2	257	5.9	262	4.8	255	9.7	277	12.2	282	3.1	250	5.0	296	15.9	248	12.9	265	12.9
3,000	261	2.9	231	16.2	272	7.4	272	7.3	278	6.2	253	9.5	283	13.2	280	4.0	264	8.6	------	------	------	------	------	------
4,000	252	2.8	265	14.0	------	------	------	------	256	8.7	273	11.4	279	11.5	268	7.5	288	11.2	------	------	------	------	------	------
5,000	------	------	------	------	------	------	------	------	265	7.9	------	------	------	------	287	6.3	291	18.0	------	------	------	------	------	------

AEROLOGICAL OBSERVATIONS FOR THE YEAR 1933

By L. T. SAMUELS

[Aerological Division, L. T. Samuels, temporarily in charge]

Mean free-air temperatures for the year at the stations shown in table 1 were mostly above normal with the largest departures occurring at Dallas and Omaha. Free-air relative humidities averaged above normal except at Omaha and Norfolk where they were below normal.

Kite observations were completely discontinued by the Weather Bureau upon the closing of the Ellendale, N.Dak., station in June 1933, and a new airplane-observation station was established in July at Pembina, N. Dak. Owing to decreased appropriations, the airplane-observation work was discontinued at Atlanta and Chicago on June 30. Airplane observations were made on all but 2 days during the year at Dallas, on all but 12 days at Cleveland, and on all but 14 at Omaha. The average height reached in these observations was 5 km.

During the International Polar Year, which ended August 31, 1933, a total of 234 sounding-balloon observations were made at 3 stations. The number of these instruments found and returned was 197 or 84 percent. In practically all cases the observations extended into the stratosphere.

TABLE 1.—*Free-air temperatures and relative humidities obtained by airplanes during 1933*

TEMPERATURE (° C.)

Altitude (meters) m.s.l.	Cleveland, Ohio (246 meters) [1]		Dallas, Tex. (146 meters) [2]		Norfolk, Va. (3 meters) [3]		Omaha, Nebr. (300 meters) [4]		Pensacola, Fla. (2 meters) [3]		San Diego, Calif. (9 meters) [2]		Washington, D.C. (2 meters) [3]	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	8.0	([5])	15.4	([5])	13.7	−0.7	7.7	([5])	18.8	+0.5	15.4	−2.0	11.0	−1.3
500	9.2	([5])	17.5	([5])	12.9	−.6	8.8	([5])	18.1	+.8	14.3	−1.1	11.5	+.4
1,000	7.5	+1.3	16.7	+2.7	11.2	−.3	10.0	+2.0	16.2	+.9	15.1	−.6	10.6	+1.2
1,500	5.4	+1.1	14.9	+2.7	------	------	8.8	+2.2	------	------	------	------	------	------
2,000	3.3	+1.1	12.6	+2.6	6.5	−.4	6.7	+2.3	11.3	+.5	12.8	+.3	6.2	+.9
2,500	1.2	+1.3	9.9	+2.4	------	------	4.1	+2.3	------	------	------	------	------	------
3,000	−1.1	+1.5	7.1	+2.2	1.8	−.4	1.2	+2.2	5.7	−.1	7.3	0.0	1.9	+.9
4,000	−6.6	+1.3	1.3	+2.0	−4.7	−1.5	−5.2	+1.6	−.1	−.1	.6	−.1	−3.3	+1.1
5,000	−12.8	+1.0	−5.1	+1.2	------	------	−11.8	+1.0	−6.5	−.1	−6.7	−.6	------	------

RELATIVE HUMIDITY (PERCENT)

Surface	79	([5])	81	([5])	71	−1	78	([5])	81	0	72	+4	76	+6
500	70	([5])	68	([5])	63	−1	70	([5])	75	+1	71	+3	66	+3
1,000	67	+2	61	−1	58	−2	57	−4	70	+2	55	+3	60	+1
1,500	64	+3	56	+2	------	------	52	−5	------	------	------	------	------	------
2,000	59	+2	52	+4	52	−2	48	−7	63	+4	35	+1	58	+2
2,500	53	0	48	+3	------	------	46	−9	------	------	------	------	------	------
3,000	51	0	45	+3	45	−2	45	−10	55	+4	29	+3	52	+3
4,000	49	+2	41	+2	53	+8	43	−10	48	+3	27	+3	46	+1
5,000	46	+1	39	+4	------	------	41	−11	44	+3	23	+1	------	------

Times of observations: Weather Bureau, 5 a.m.; Navy, 7 a.m., E.S.T.

[1] Temperature departures based on normals determined by extrapolating latitudinally those of Royal Center, Ind., and Due West, S.C. Humidity departures based on normals of Royal Center, Ind.

[2] Temperature departures based on normals determined by interpolating latitudinally those of Groesbeck, Tex., and Broken Arrow, Okla. Humidity departures based on normals of Groesbeck, Tex.

[3] Naval air stations.

[4] Temperature and humidity departures based on normals of Drexel, Nebr.

[5] Surface and 500-meter level departures omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.

RIVERS AND FLOODS

By MONTROSE W. HAYES

[In charge River and Flood Division]

During December 1933 there were floods in the Green River of Kentucky and in the Columbia Basin. A discussion of these overflows, together with a statement of flood losses during the year, will appear in a later issue of the REVIEW.